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ABSTRACT

This paper describes the new phase of the Economic and Social Research Council (ESRC) initiative in Information Technology in Education for the period 1988-93. The first sections of the paper discuss the rationale and framework of the program as a whole, followed by outlines of the initial programs of research started in autumn 1988 to investigate three issues--group work with computers, conceptual change in science, and tools for exploratory learning. Program evaluation, coordination, and management are then addressed. The paper continues with the longer term provisional agenda for future research, and describes a strategy and structure for basic research into the applications of information technology to learning and teaching. The appendixes provide a summary of the pilot phase of the program from 1985 to 1988, a list of seminars, and a list of occasional papers. (MES)

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Information Technology in Education Research Programme 88 – 93

Occasional Paper InTER/1/88
September 1988

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INFORMATION TECHNOLOGY IN EDUCATION RESEARCH PROGRAMME

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INFORMATION TECHNOLOGY IN EDUCATION RESEARCH PROGRAMME 1988 – 93

INTRODUCTION

This paper describes the new phase of the ESRC initiative in Information Technology in Education for the period 1988-93. A Coordinating Centre, a Programme Evaluation Unit and three Research Centres have been approved for work over the next three years with support from ESRC of over £1M as part of the research initiative programme of the Human Behaviour and Development (HBD) Research Development Group.

The first sections of the paper describe the rationale and the framework of the Programme as a whole followed by outlines of the initial programmes of research which started in the autumn of 1988. The main research activity is based on groups of researchers, identified as belonging to 'research centres' having specific responsibility for sections of a research agenda. There is a 'coordinating centre' which carries overall responsibility for the general management of the Programme, and a Programme evaluation unit.

The paper continues with the longer term provisional agenda for future research. It describes a strategy and structure for basic research into the applications of information technology (IT) to learning and teaching that are scheduled. It must be emphasised, however, that the priorities and the schedule itself have been formed on the basis of current perspectives and may well change over the lifetime of the Programme.

Appendices provide a summary of the pilot phase of the Programme during the period 1985-88.

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1. THE RATIONALE FOR THE PROGRAMME

ESRC has the responsibility to play a critical role in the evolution of new ways in which technology may contribute to learning; no other UK agency carries the brief to undertake and stimulate the necessary basic research. The uncertain pragmatics of early work on classroom technologies must now give way to more clearly defined studies. Cognitive science, which promises to provide the basic concepts for work on teaching and learning, is now achieving some maturity. Nevertheless, present work remains somewhat scattered. Whilst diversity of approach is undoubtedly important when new problems are to be solved, an investment is required in broadly managed programmes across this multidisciplinary field to promote the development of 'critical mass' and the emergence of directions for change.

The potential of this work will be realised only if the most exciting lines of research are communicated in a way which makes them accessible to practitioners for wider trial and evaluation. In order to achieve this we need to bond some of the best research in cognitive science to that on classroom learning to the benefit of both areas of study.

2. THE CURRENT RESEARCH PROGRAMMES

Research Centres are being identified to take responsibility for the management of a portion of the research agenda. Following a tendering and peer review process conducted in the spring and early summer of 1988, three major research contracts of £250,000 each for three years have been awarded. The centres are inter-disciplinary and inter-institutional. As part of their research contracts, the centres have been allocated resources to stimulate collaboration on a national basis for their respective research topics. The responsibilities of each centre include the management of a seminar programme, to include practitioners and appropriate policy makers. They also have responsibility for disseminating and supporting the outcomes of its work alongside the Coordinating Centre.

In this first phase of research, four themes were selected as having well-founded bases of research which were ripe for expression in a technological context. The four themes chosen were interrelated, yet each had a distinct focus. These themes were:

- collaborative learning, stimulated or enhanced by problem solving tasks requiring computer interaction and in part influenced by social context;
- the development of basic concepts in mathematics and science building on existing research into earlier conceptions, sometimes naive, of natural phenomena;
- the value of technology-based tools for exploratory learning based on experience of modelling in the industrial sector and of simulation-based discovery learning in education combined with opportunities for learners to express their own knowledge of a domain;
- the identification and evaluation of learning gains achieved through the uses of information technology.

In the event, proposals were accepted for work on the first three of these themes although elements of these investigations may include evidence on the last kind. Proposals were made for research with learners of all ages but the successful ones all focus on young learners. This provides the benefit of allowing inter-relation between the programmes and, in practice, detailed research can only be undertaken with learners who are relatively free to devote time to experimental learning situations. However, it does leave unanswered the question of the applicability of outcomes to the broader constituency of learners. Such questions are accepted as important and it is expected that the scope of some of the work will be extended through support from other agencies.

Summaries of the first three programmes are given below. Full details of these research programmes will be contained in forthcoming InTER Occasional Papers.

GROUPWORK WITH COMPUTERS

Professor Michael Eraut, University of Sussex and Professor Celia Hoyles, Institute of Education, London

Key issues in this work may be best expressed as questions, answers to which will provide guidance to teachers seeking to gain the maximum benefit from the use of computers.

- For what types of learning goal is groupwork with computers most appropriate?
- What is its potential contribution to the curriculum?
- How can computer and non-computer based tasks be designed which facilitate groupwork?
- Is it possible to identify criteria for task design, group management and their interrelationships for effective groupwork to be established?
- What kinds of group are best for achieving particular goals?
- How can such groupwork best be prepared for, implemented and evaluated?
- Is training in collaborative groupwork a significant advantage?

Some of the answers to these questions will be very provisional, or confined in the first instance to a limited number of contexts. But nevertheless the researchers believe that considerable progress can be made and that the 3-year programme will generate knowledge of considerable value to teachers as well as the research community. Work will be confined to that with children in the 9-12 age range.

Earlier findings of the current ESRC project "Information Technology and the Whole Curriculum 9-14" is that while pupils frequently work with computers in groups, the purpose is usually to maximise access to a limited number of terminals. Hence the potential of groupwork is rarely exploited and collaborative learning in such groups happens more by chance than design. Sometimes the task is not even perceived as groupwork, but prepared and initiated as if it was an individual task which circumstances force pupils to undertake together. At best attention is rarely given to promoting or rewarding collaboration, even when the teacher is hoping it will occur.

Scarcity of computers is likely to make working in groups a practical necessity for many years ahead. So it is important for teachers to learn how to exploit rather than ignore the potential of collaborative working in groups. However, the empirical base for providing advice on these matters is exceedingly limited. There have been a small number of studies in single contexts, which do not yield similar conclusions - hardly surprising in view of the large number of variables. The best of them suggest aspects of groupwork with computers which this programme will seek to investigate further, but clearly research in this area is still in its infancy.

In addition to this important practical reason for learning more about groupwork with computers, there are some compelling theoretical reasons for believing that groupwork has considerable potential for enhancement of learning. It may not be just a question of showing that learning in groups can be equally effective as individual learning. There are some learning goals and tasks, for which psychologists believe that groupwork is likely to be more effective. The research will include investigation of the importance of motivation and the role of peer tutoring. Lessons may be learned which will apply to learners of other ages and in different contexts, for example, to vocational training.

The research will be undertaken in schools with which the researchers already have good relationships in the south eastern counties and in the north of London. Part of the study will build upon established research experience in the field of mathematics.

CONCEPTUAL CHANGE IN SCIENCE

Dr Rosalind Driver and Roger Hartley, University of Leeds; Professor Tim O'Shea and Eileen Scanlon, Open University and Dr. Stephen Draper, University of Glasgow

The research aims to clarify and describe the process of change in learners' conceptual understandings of natural phenomena. It will begin by reviewing the existing literature on models of conceptual change and on children's conceptions in a number of selected topic areas. Strategies will be identified for exploring and developing children's ideas with software which could be useful in investigating children's reasoning and promoting conceptual change.

From this review, two or possibly three topics will be selected, where progress in understanding involves different types of conceptual change. For each area, the prior conceptions of a number of children will be explored in some detail with a range of phenomena and will be documented using talk-aloud protocols.

A range of intervention strategies will be devised to promote conceptual change, focusing on the development and use of computer-based methods and approaches based on *ARK*-like and *STELLA*-like software. Detailed protocols of the outcomes of these interventions will be produced from a video and audio tape record. The extent of conceptual change will be assessed by readministration of the original tasks; and the protocols of the intervention strategies will be analysed also, to develop a theoretical description of the change process.

The analyses from all the selected topic domains will be used to develop a more general description of the processes involved in conceptual change, and hypotheses

arising from this work will be tested with other groups of children through experimental studies.

The research project is to be located in three institutions: the Universities of Leeds and Glasgow and the Open University.

Glasgow University will concentrate on producing *ARK*-like software for use by the other members of the consortium. It will carry out studies of the user interface from both the teacher's and the pupil's viewpoint. It will address the theoretical issue of the psychological relationship between factors promoting conceptual change on the one hand, and ease of use of the software on the other.

Leeds University will concentrate on studies of childrens' conceptualisations in the topic areas, on the interventions for conceptual change, on the design/development of software tools (primarily *STELLA*-based) and will participate in the evaluation studies and discrimination activities.

The Open University will carry out classroom studies using simulations constructed with *ARK*-like software and will extend that software to make it usable by different communities, including pupils, teachers and educational researchers.

TOOLS FOR EXPLORATORY LEARNING

London Mental Models Group, with Dr. Joan Bliss, King's College London and Professor Jon Ogborn, Institute of Education, London as Co-directors with Jonathan Briggs, Kingston Polytechnic and Derek Brough, Imperial College.

The programme will examine the role of tools in exploratory learning through a series of extended-time studies with children between the ages of 10-16. To do this it will modify and/or extend existing software tools and develop new tools where necessary. Analysis of existing tools indicates an important distinction between expressive tools where learners explore their own models of a domain and exploratory tools which allow learners to investigate models of a given domain which are different from theirs. Further distinctions are made between quantitative, qualitative and semi-quantitative tools for both exploratory and expressive tools.

Models are of particular interest in education because it is the role of the teacher or the educator to provide children with appropriate representations or models in a range of domains of knowledge. Clearly these representations should be accurate and consistent but not necessarily complete. Another significant problem for education is how learners can move from their own mental model of a situation to the conceptual model required for a richer understanding of the situation.

The questions to be addressed by the programme are:

- in what ways can interaction with tools containing representations of a domain facilitate learning of that domain?
- are learners helped by representing and exploring the consequences of their own mental models of a domain?

For the domains under study the more quantitative will be selected from technology and the more qualitative from social situations, for example in the humanities. There will be some expert model of the domain, distinct from the

learner's. In the first phase of the programme, while working with already existing conceptual models, it will be necessary to formalise the expert's knowledge of the domains since the structure of exploratory tools depends on the nature of the expert's model. It will also be as necessary to elicit the learners' knowledge of the domains and to have some level of formalisation of this, thus providing the primitives needed for expressive tools. Such data will also provide a description of the learner's spontaneous mental models in the domains.

The second phase of the programme, focusing on the extended-time studies, will address, in addition to the two main questions specific to the nature of tools details above, three other questions specific to learners:

- At what point does it become meaningful to talk about children constructing models? In other words, at what point can children understand the notion of a model as standing for something other than it is?

- What do learners need to know and at what age in order to be able to use exploratory and expressive tools?

- How do the exploratory learning experiences of children in the domain of technology and social situations contrast with one another?

The research will focus specifically on individual learning. The diagnosis and description, through the extended-time studies, of how learners' models are modified, changed or extended through interaction with the various kinds of tools will permit a formulation of a clearer description of the function of exploratory and expressive tools.

3. THE PROGRAMME EVALUATION

This will be undertaken by Professor Barry MacDonald and Ian Stronach based at the University of East Anglia

The brief, as expressed in the tendering invitation, was as follows:

"Evaluation of the Programme is to be independent and will monitor and advise the participants throughout the life of the Programme. From time to time, it will evaluate the effectiveness of the overall strategy adopted for this style of initiative and report to the Programme's Steering Committee.

The evaluators' brief is to attend to the effectiveness of such matters as:

- the procedures for inviting, modifying, vetting and selecting proposals;
- communications between research centres, with national and international agencies, and with the wider community of interests;
- integration of policy makers and practitioners in the further definition of the research agenda and its priorities;
- reporting mechanisms to ESRC; and on the role of the Co-ordination Unit as perceived in the research centres and the wider research community."

The response to these aims views evaluation as defined as the process of conceiving, constructing and distributing information to guide judgment and action in relation to specified activities. Applied to the InTER Programme and bearing

in mind the specifications contained in the brief, the definition may be translated as six main tasks:

- to encourage the process of critical self-reflection within the Programme by bringing to bear the perspective of an institutional outsider;
- to assist policymaking at all levels (Council, Steering Committee, Coordination Centre and Research Centres) by elucidating theoretical and analytical models of their management, by providing independent checks on their own observations, additional evidence of the impact of their actions and alternative perspectives;
- to assist Steering Committee in particular through periodic overviews of Programme progress and focused studies of issues with significant implications for overall policy;
- to improve the quality of information-sharing within the Programme, seeking to improve its validity by discrepancy identification and its utility by constructing profiles of information need based on actor frames of reference;
- to assist the process of communicating the work of the Programme to interested non-participants, to those to whom Programme actors are accountable and to the community at large;
- to characterise, preserve and make available in useful form the learning of the Programme, for those who may be called upon to build on its experience.

These aims, to the extend that they are fulfilled, will help the Programme to become more effective in its own terms. This implies, therefore, a participant form of evaluation. It is important, for the credibility of its claim to independence, that limits are set for this participation.. The evaluation is accountable for the quality of the information it provides but not for actions taken on the basis of that information. The evaluation will therefore stop short of making recommendations for action. It will, however, where appropriate and feasible, elaborate options for action and estimate the possible costs and benefits of alternative courses of action. The evaluation will not be docile to hierarchies of Programme power, though it will be responsive to the distribution of responsibilities and sensitive to custom, expectation and vulnerability. The evaluation will use its independence to be impartial – that is to say, to take all legitimate interests into account. These are the most important limits to its participant status and will be requested in principle and respected in practice.

In order to achieve these aims the evaluators will have to establish collaborative relationships with Programme participants at all levels. To this end the conduct of the evaluation will be governed by an agreed code of principles and procedures and the evaluators will maintain a substantial presence in the field.

The evaluators will report formally to the Steering Committee as and when required on matters referred to them by the Committee, as well as on matters raised by other participants. They will also report to other groups within the Programme and to interested parties outside, subject to the rules of the code.

It is not possible to provide a detailed schedule of evaluation activities throughout the period of funding, because of the need to reserve a flexibility of response to information needs and priorities which cannot be anticipated beyond the initial period. However, the aims embody a number of tasks deduced from Programme values and goals and from the details of the evaluation brief. These indicate some

initial activities that constitute how the evaluation will engage the Programme and how it will set about developing a further agenda.

Methodologically, the evaluation favours what has recently come to be known as a naturalistic approach to the generation and reporting of data. This typically favours qualitative methods and relies heavily upon contextualised judgment data. However, responsiveness and a commitment to utility call for methodological flexibility and the evaluators anticipate that the variety of information needs that they will face during the life of the Programme will require the deployment of variety of methods of data gathering, including survey instruments.

4. COORDINATION AND MANAGEMENT

This will continue to be based at the University of Lancaster following the pilot phase of the Programme which ran between 1985 and 1988 (see Appendices). The Programme will be coordinated by Professor Bob Lewis assisted by Maureen Boots, the Programme's Administrative Assistant, and Mark Bryson as Technical Research Assistant.

The Coordinating Centre has the following functions:

- to carry a continuing brief from ESRC in the formulation of a substantive research agenda;
- to assist in securing tenders for research in fields which map onto the identified priority areas;
- to ensure that researchers outside the 'research centre' institutions are aware of, and can contribute to, the overall Programme and that their research is supported through collaborative projects;
- to ensure multidisciplinary coordination (seminars and personal contact) between the 'centres' as appropriate;
- to stimulate the integration of practitioners and policy makers in research as researchers through education authorities and industrial training bodies;
- to provide information, through appropriate media, to the whole community which will enhance opportunities for researcher and practitioner contributions to substantive research within the Programme and beyond;
- to liaise and seek additional contributions in the formulation of the research/evaluation agenda and its execution from other bodies (DES, SED, TC, DTI, EEC, UNESCO, industry, training bodies, etc.);
- to support UK participation in multi-national conferences, programmes and projects organised by such agencies as the British Council and the EEC (ESPRIT, DELTA and COMETT);
- to assist ESRC in its relations with SERC, DTI etc. in post-Alvey, joint Research Council approaches to cognitive science and human computer interaction, and other joint governmental initiatives which require an IT and education contribution.

Planning for the next phase of the research has already started with two invited seminars on:

- policy and implementation of IT in education (July 1988) and
- support tools for authoring (September 1988).

In addition to support for the research programmes, the Coordinating Centre will undertake many of the functions present during the pilot phase. There will remain the main infrastructure support for IT in education research being undertaken by researchers supported by all UK agencies, dissemination, including by making accessible research outcomes to practitioners and policy makers and, stimulating research opportunities by fostering collaboration with agencies inside and outside the UK.

The integrated electronic information and communication services will continue to be improved. This will be aided by new and much more powerful facilities available through the Computer Centre at Lancaster and accessible through academic and public data networks.

The work of the Coordinating Centre and the Programme as a whole will be advised by a Steering Committee of HBD Research Development Group members. Initially these are:

- Mrs Margot Cameron-Jones (vice-chairman of HBD, Moray House College, Edinburgh);
- Professor Tony Edwards (University of Newcastle);
- Professor Philip Levy (chairman of HBD, University of Lancaster);
- Professor Paul Light (Open University);
- Professor Tom Wilson (University of Sheffield).

In addition this committee will be enlarged to form a Programme Advisory Group. At the moment this has the following additional members:

- SI Gabriel Goldstein or HMI George Searle, DES;
- CI Walter Beveridge or HMI John MacDonald, SED;
- Rob Wormald, Head of the Learning Technology Unit, Training Agency.

Both the Steering Committee and the Programme Advisory Group are chaired by Mrs. Margot Cameron-Jones.

Following the close association of the pilot programme with the Learning Technology Unit (LTU) and other branches of the Manpower Services Commission/Training Commission, the first collaborative actions of the new Programme are with the Department of Employment - Training Agency:

- support to the Training Agency in LTU's role as UK Contact Point for the EC DELTA Project. A HELP-line to support those seeking partners or requiring technical advice will run through to the end of October 1988 when DELTA proposals are to be submitted. Future action has to be decided.
- support for the AI Applications to Learning Programme in carrying out a survey of projects and programmes in the uses of AI techniques to support learning. A report will be published early in 1989.
- a planning project for the Learning Systems and Access Branch on the feasibility of making use of new communication technologies to provide open learning opportunities to professionals through electronic access to human tutors and information sources in universities.
- a major three-year project for the TVEI Teacher Support Unit to identify the effective deployment of resources to support teachers in their use of information technologies in classrooms (with the Department of Psychology at Lancaster and Cumbria and Lancashire LEAs).

Other collaborative actions include:

- continuation of the ESRC/CNRS Franco-British programme on supporting professional and vocational training with the new technologies;
- continuation of the EUROTECNET project with European partners on the methodologies of evaluating the use of new technologies in training. This has an enhanced UK dimension following support from the LTU.
- continuation of the Yugoslav-British programme (Advancement of Learning through New Technologies, ALNeT) with support UNESCO for a series of summer schools for teacher educators from developing countries.
- the recent establishment of a working group of the International Federation for Information Processing on research agendas and priorities in member countries. This follows support from the EC for a European seminar on this topic; the purpose of such action is to identify common areas of research and stimulate bilateral and multilateral projects.

5. AN AGENDA FOR RESEARCH

Eleven topics for research were included in the proposal to establish the Programme submitted to ESRC. The first four were included in the Tender Invitation issued in February 1988 as meeting the criteria of having well-founded bases of research ripe for expression in a technological context. Of these, resources were available to start work on three as outlined in Section 3. The fourth, which remains of key importance and for which further resources are being sought, is an evaluation of change in learning. The theme was originally described as follows though this is likely to require revision to ensure that it builds on and complements the research already underway.

Evaluation of Change in Learning. Studies are required which focus on the evaluation of the understandings achieved from the uses of IT. Such uses aim to provide bridges between concrete and abstract formulation of ideas, allow experience of testing alternative problem-solving strategies and create new relationships between teachers and learners. With young or adult learners, the outcomes of their new experiences need to be assessed. These may be of a cognitive, social or behavioural nature. As with any new method of instruction, there will be novel outcomes. A few studies have undertaken pioneering work, especially in the challenging area of assessing the consequences of open learning systems. If researchers are to persuade others of the value of their work, it will be necessary to create and test evaluation schemas having wide currency in the research and educational community. Research will be supported which identifies tangible indicators of change based on established benchmarks.

Details of the remainder of the agenda will all require further analysis. They are outlined here to indicate the general scope of the Programme but are not listed in priority order.

Four topics have growing significance though they need further refinement through consultation between research and education communities. The last three are seen to have European importance and are included in Action Lines of the EEc DELTA Programme.

Language Skills. The teaching of language-related skills is also a challenging arena for the deployment of new technologies. There is a keen interest in the use of word processors in the classroom, and there is speculation about the socio-linguistic consequences of children engaging in shared composition tasks. What particular aspects of the natural language and foreign language teaching curricula might be significantly aided by IT implementations? Does communication through the new technologies (eg. videotext, electronic mail) demand new language skills on the part of the recipient (and the provider) of information? What novel and desirable aspects of curriculum can be introduced or given new emphasis by the technology? Recent research in applied linguistics and expanding notions of literacy in the classroom also provide a stimulus for this topic. The first issue is to identify the key contributions that the technologies might plausibly make in the next ten years and to focus some of the research upon a more explicit set of theoretical perspectives.

Support Tools. One hour of quite conventional software designed for learning currently takes at least one person-year for its development, production and evaluation. A systems analysis of development and production is required in order to identify the specific tasks within that process. It will then be possible to draw on specialist techniques and tools in artificial intelligence in order to develop programming tools suited to the creation of software for learning. Different tools will be required for different knowledge domains. Further, we should be able to make better use of available software by developing some common management systems which are better adapted to young people. Software which links causal modelling with expert explanation is not common and its design requires basic research. The mapping of appropriate 'expert' explanation onto learners' needs requires exploration if we are to achieve the long-term goal of building models of learners knowledge ('mental models') into intelligent tutoring software.

The Learner-Machine Interface. The needs of the learner, and especially the young learner and learners with special needs, deserve as much, if not more, attention from interface designers as do those of office workers, machine operators and managers. The design of screen displays, iconic and other representations, and the roles of keyboard, mouse, joystick, digitised pad and touch screens are likely to be particularly sharp issues for early learning. This item overlaps somewhat with the case for support tools and the issue of computer literacy referred to below.

Policy and Management Issues. The size of the capital investment programmes that will be needed in the long run suggests an anticipatory study of the economics of introducing the new technologies and the principles that might need to be deployed. Studies associated with teacher and trainer education are required which address policy and management issues in the effective deployment of resources and the support structures which will be necessary for integrated use of the technology in schools, colleges and industry.

The last three items also have importance which is of special interest to other agencies who will be engaged in refining the research framework and contributing to resourcing the research.

Teacher Education. Teacher education lies at the heart of innovation in the classroom. Teaching styles are changing in many classrooms and will change more widely as a consequence of the methods implied by the new national curriculum. Questions about changes arising from the introduction of IT in the classroom are only a part of a broader set of issues about the effectiveness of professional development which is offered in many forms. The research issues are:

- What are the effective teacher behaviours for which training methods must be designed?
- How effective are the training methods?
- What guidelines can be developed for training course design?

These questions will be addressed by experimental course design and its evaluation in collaboration with LEAs and colleges.

Computer Literacy. It is a truism that what we know now largely determines how readily we can adapt to new knowledge. Research must be undertaken on children's notions of computers, leading to a formal analysis of the basic concepts in IT literacy. This work is urgent if we are to establish a baseline from which to be able, later, to identify the changes in children's development brought about by their contact with the new technologies.

Open and Distance Learning. The new technologies have stimulated great interest in methods for facilitating open access to learning and learning at a distance. These moves are increasingly having impact upon adult learning and re-training. The willingness of US adults to learn new skills and to change jobs alongside the development of community schools and colleges is often cited as indicating the attitude shift needed in other technological societies, including our own. The Training Agency's experiences in industry and in further education, along with those of the Open University, are also relevant here; and we might anticipate that these changes in post-school experiences will deserve some representation in the styles and practices in schools themselves and in conventional higher education. Studies which trace and evaluate these moves, and which identify criteria - social and economic - for the development and delivery of open learning, are implied.

APPENDIX A: THE PILOT PROGRAMME: 1985 - 88

The three-year pilot IT and Education Programme was financed through the former Education and Human Development Committee of ESRC at a total cost of £250k. It created a co-ordination unit with the following aims:

- to review, evaluate and disseminate recent and current activities in the field of IT and Education;
- to identify the needs of Education in relation to IT;
- to stimulate relevant research and to formulate research guidelines;
- to establish and maintain a database of relevant work and to undertake arrangements for coordinating and networking those active in the field including cognitive scientists, educational researchers, practitioners and policy makers.

The initial policy recognised the importance of involving practitioners and policy makers in the development of a programme of substantive research and research-related activities. It recognised the necessity of ensuring close collaboration with commercial organisations such as publishers, training bodies, software houses and hardware manufacturers. The strategic aims of the Programme have been to influence the directions of research, to draw the attention of some of the best researchers in associated disciplines to the challenges of information technology in education, and to provide a research infrastructure to accelerate collaboration and communication.

During its pilot phase, the Programme has undertaken or promoted a number of actions. These are outlined below.

The co-ordination of relevant research grants awarded by ESRC through the normal research grant competition, and in several cases assistance given in their preparation and reformulation.

The enhancement of some ESRC research projects with funds from other agencies such as Leverhulme, LEAs, the Training Commission, and hardware and software companies.

The co-ordination of linked studentships awarded by EHDC.

The stimulation and management of a teacher-fellowship programme funded by DES but negotiated with individual LEAs. This programme was proposed to the DES and accepted with conditions that each fellowship proposal be assessed by the Coordinator. Accepted proposals from LEAs required that a tractable action-research project was formulated jointly by an LEA adviser, a teacher and a research supervisor from a university or institution of higher education. The Programme established the contact between the personnel and mediated in the formulation of the research task. To support this research, a number of special seminars and research-training workshops were organised and, in addition, teacher-fellows contributed to certain of the Programme's invited seminars.

The regular networking of members of the 'community'. Thirteen seminars were held for researchers, practitioners and policy makers; five workshops for teacher-fellows; and five advisory meetings were held with research grant holders (see Appendix B). A review paper on 'Research Needs' was

commissioned by the DES. Wider dissemination was achieved by publication of a series of occasional papers (listed in Appendix C), and four review papers were commissioned for The Times Educational Supplement.

The provision of an electronic networking service, for established and new researchers, research students and teacher fellows. LEAs and colleges also have access to the networks. A high volume of 'traffic' has been developing. The coordinator also engaged in other UK and European plans for electronic networking.

The establishment of a 'map' of UK expertise (and a growing one for European expertise). Such a map reflects the achievements (as acknowledged within the academic community and by contributions to the wider educational system) of individuals and research teams. The value of the map is two-fold. First, it allows the Programme to match experience and expertise with the stated needs of policy makers and others in search of research partners (eg. with Training Commission (TC) and EEC initiatives). Thus the opportunities for UK researchers to resource fundamental and strategic research are increased. Secondly, it allows the Programme to identify lines of research which benefit from the approach of research teams from different disciplines and to stimulate collaborative actions between such teams.

The establishment of links with other agencies. Both national (e.g. TC, DES, SED, DTI) and international (e.g. OECD, EEC, UNESCO, British Council) agencies have been engaged with the Programme. Seminars of UK workers and those in Europe have been organised.

In the absence of independent evaluation these actions over the period 1985-88 cannot be labelled 'achievements' but it may be claimed that the initial goals of the pilot Programme have largely been achieved. The degree of interaction between researchers in various fields has been improved, as has the contact between practitioners, policy makers and researchers. The potential contribution of research to practice in this field is now accepted within many governmental and commercial organisations.

The creation of specific links is a first step towards closer long-term collaboration and support. Such links require reinforcement before they become a permanent feature of research and development and sustained effort is required of all parties. For these reasons, the next stage of the Programme is crucial, both in terms of its contribution to academic development and its strategic contribution to progress in teaching and learning.

The main problem for the pilot Programme was its inability to provide direct funding to match the increased potential it created for co-ordinated research activity. Within the scale of budgets operating in 1984, it was not possible to earmark significant sums for substantive research, and there was little room to map emergent research priorities onto the normal research grants awarded by the EHD Committee. Further, the small numbers of studentships available to the former EHDC did not allow a sufficiently strategic framework for research training. It was the final wish of that Committee that the next phase of the Programme should emphasise substantial and well-identified areas of research.

APPENDIX B - LIST OF SEMINARS

ESRC-ITE Seminars

- AI and CAL development (February 1985);
- Information technology literacy (March 1985);
- Implanting innovation and teacher education (March 1985);
- AI techniques and learning (July 1985);
- Classroom processes (December 1985);
- Screen design (February 1986);
- Patterns of in-service education (December 1986);
- New learning environments (microworlds) (March 1987);
- Gender differences in IT (March 1987).
- Electronic communication (May 1987);
- 'Plans' for intelligent authoring systems (June 1987);
- Research in progress and research training needs (July 1987);
- IT support in learning basic concepts in mathematics and science (December, 1987);
- Evaluation of the InTER Programme (June, 1988);
- Policy and implemenation of IT in education (July 1988);
- Support tools for authors of computer supported learning materials (Sepember, 1988)

Other seminars have included:

- Advisory meetings for the EHDC award holders (including Moore, Kent, Nicholson, Hoyles, Cox);
- The ESRC/CNRS seminar on three themes - technology literacy, artificial intelligence and problem solving (December 1985);
- Seminar with scientific attaches from EEC member states to establish links with other research councils;
- EEC funded seminar for representatives from the Research Councils of Member States to identify respective research agenda and priorities (held in Paris, June 1987);
- Evaluation strategies for major initiatives in the new technologies (for MSC, June 1987);
- Knowledge representation formalisms and training needs (for the Training Commission's AI in Learning Programme, June 1988).

Teacher-fellow seminars/workshops:

- Fellows, advisers and supervisors - initial meeting (September 1986);
- Research methods - case study design (October, 1986);
- Research methods - classroom observation (October 1986);
- Fellows seminar - progress and problems (November 1986);
- Fellows, advisers and supervisors - review meeting (January, 1987).

Support in organisation and running of Conferences:

- ESRC-funded international workshop on Computer Aided Learning in the Humanities and Social Sciences;
- Trends in Computer Assisted Education - Universities of Lancaster and Loughborough;
- International Working Conference on Artificial Intelligence Tools in Education (for the International Federation for Information Processing).

APPENDIX C - LIST OF OCCASIONAL PAPERS

ITE/3/85 Spring Seminars Report, May 1985

ITE/9/86 Research Needs for Educational Uses of IT, May 1986

ITE/12/86 Classroom Processes, seminar paper September 1986

ITE/13/86 DES/ESRC Teacher Fellowship Research, November 1986

ITE/14/86 International Electronic Services, November 1986

ITE/16/86 Information and Communication, December 1986

ITE/17/87 Peer Interaction and Logic Programming, January 1987

ITE/18/87 Computer Education Activities and Pupil's Attitudes to Computers, research report, May 1987

ITE/19/87 The ESRC-ITE Programme - two years on, May 1987

ITE/20/87 CBT Evaluation Techniques and Processes, July 1987

ITE/21/87 IT and In-Service Teacher Education, September 1987

ITE/22/87 Computer Based Communications in Education, October 1987

ITE/23/87 ESRC-ITE Electronic Services, December 1987

ITE/24/88 Teacher-fellow Research 1986/87 - abstracts, January 1988

ITE/25a/88 Research in Progress - research studentships, January 1988

ITE/25b/88 Research in Progress - research projects, January 1988

ITE/26/88 Learning through Microworlds - seminar report, January 1988

ITE/27/88 Authoring of Computer Based Training Materials - a study report for the Training Commission, June 1988

ITE/28/88 Four research survey reports, June 1988
- microcomputers in primary education
- microcomputers in secondary education
- issues for LEA advisers
- policies and trends in IT and education

ITE/29/88 Learners' concepts in mathematics and science - a seminar report, July, 1988

ITE/30/88 A review of research in IT and primary schools - a report for the Scottish Education Department, August 1988

ESRC PUBLICATIONS RELATING TO INFORMATION TECHNOLOGY AND EDUCATION

Available from:

Economic and Social Research Council
160, Great Portland Street
London W1N 6BA – Telephone: 01 – 637 1499

Microcomputers in Education – a framework for research
(Morley Sage and David J. Smith)
Published by SSRC 1983 ISBN 0 86226 125 2 Price £2

Intelligent knowledge – based Systems
– UK Social Science Research Inputs
(Linda A. Murray and John T.E. Richardson)
Published by ESRC 1984 ISBN 0 86226 108 2 Price £2

Information Technology and Education
– signposts and research directions (Editor David J. Smith)
Published by ESRC 1984 ISBN 0 86226 152 X Price £5

From:

School Government Publishing Company
Darby House
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Information and Communication Technologies:
Social Science Research and Training
Volume 1: An Overview of Research
William H Melody and Robin E Mansell
ISBN 0 866226 179 1

Volume 2: National Directory
Robin E Mansell (editor) assisted by Barbara Richards
ISBN 0 866226 184 8

Price £10 (two volumes)

From Blackwell Scientific Publications:

Trends in Computer Assisted Education – the proceedings of the 6th Conference on Computers in Higher Education held in April 1986 and supported by CET and the ITE Programme. Published January 1987.

Computer Assisted Learning in the Social Sciences and Humanities – the proceedings of the ESRC International Seminar held in April 1986. Published summer 1987.

[For ITE Programme and InTER Programme papers, see outside back cover.]

Papers currently available at no cost from:

ESRC – InTER Programme, Department of Psychology,
University of Lancaster, Lancaster LA1 4YF
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Fax: 0524 – 841710
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JANET: inter@uk.ac.lancs.cent1
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DARPA: inter%cent1.lancs.ac.uk.@cunyvm.cuny.edu
EuroKom: ESRCITE_Prog_Lancaster%eurokom.ucd.irl@euroies.uucp

ITE Series of Occasional Papers:

A full list of papers in this series is available from the Programme. Please note that some listed may be available in photocopy form only.

InTER Series of Occasional Papers:

InTER/ 1/88 The Information Technology in Education Research Programme, September 1988

InTER/ 2/88 Artificial Intelligence Applications to Learning and Training – a seminar report to the Training Commission, August 1988

InTER/ 3/88 The InTER Programme: Groupwork with Computers, October 1988

InTER/ 4/88 The InTER Programme: Conceptual Change in Science, October 1988

InTER/ 5/88 The InTER Programme: Tools for Exploratory Learning, October 1988

InTER/ 6/88 The InTER Programme: The Independent Policy Evaluation, October 1988

InTER/ 7/88 Support Tools for Authoring – a seminar report, December 1988

InTER/ 8/89 Research in Progress – update March 1989

InTER/9a/89 A Guide to the Electronic Services, May 1989

InTER/9b/89 The Caucus Computer Conference System, November 1989

InTER/10/89 Information Technology and Language Development – a seminar report, July 1989

InTER/11/89 Barriers to Innovation – a seminar report, July 1989

InTER/12/89 Information Technology – based Open Learning – a Study report, July 1989

InTER/13/89 Authoring Tools for simulation – based CBT – an interim project report, July 1989